1. About this Guide

This guide details the steps required to configure a load balanced YSoft SafeQ environment utilizing Loadbalancer.org appliances. It covers the configuration of the load balancers and also any YSoft SafeQ configuration changes that are required to enable load balancing.

For more information about initial appliance deployment, network configuration and using the Web User Interface (WebUI), please also refer to the Administration Manual.

2. Loadbalancer.org Appliances Supported

All our products can be used with YSoft SafeQ. For full specifications of available models please refer to https://www.loadbalancer.org/products.

Some features may not be available or fully supported in all cloud platforms due to platform specific limitations. For more details, please refer to the "Main Differences to our Standard (Non-Cloud) Product" section in the appropriate cloud platform Quick Start Guide or check with Loadbalancer.org support.

3. Software Versions Supported

3.1. Loadbalancer.org Appliance

- V8.9.1 and later

Note: The screenshots used throughout this document aim to track the latest Loadbalancer.org software version. If you’re using an older version, or the very latest, the screenshots presented here may not match your WebUI exactly.

3.2. YSoft SafeQ

- Version 6 rev. 42

4. YSoft SafeQ

YSoft SafeQ provides centralized print management and digital workflows to support business growth while solving cost, security and accountability requirements. SafeQ brings administrative visibility and easy control of print services to the table through a comprehensive dashboard, reducing the burden on and freeing up IT resources.

5. Load Balancing YSoft SafeQ

Note: It’s highly recommended that you have a working YSoft SafeQ environment first before implementing the load balancer.

5.1. Introduction and Overview of Different Modes
For a SafeQ deployment, the preferred and default load balancer configuration uses Layer 4 DR Mode (Direct Routing, aka DSR / Direct Server Return). This is a very high performance solution that requires little change to your existing infrastructure. It is necessary to solve “the ARP problem” on the real print servers. This is a straightforward process, and is detailed in Solving the ARP Problem.

It is also possible to load balance a SafeQ deployment using Layer 7 SNAT Mode. This mode might be preferable if making changes to the real print servers is not possible, although some Windows Registry keys need to be added. Due to the increased amount of information at layer 7, performance is not as fast as at layer 4. Also note that load balanced connections at layer 7 are not source IP transparent, which is not usually an issue when load balancing print servers but should still be considered.

5.2. Load Balancing & HA Requirements
A load balanced YSoft SafeQ environment requires the following:

- Microsoft Windows Server environment
- Installation of SafeQ (Version 6 rev. 42)

5.3. Overview of Steps Required
Setting up a load balanced YSoft SafeQ environment can be summarised as follows:

- Create a virtual service (VIP) on the load balancer that listens on the required ports
- Associate the print servers to the virtual service, i.e. define them as ‘real servers’ (RIPs) for the VIP
- Install and configure the YSoft SafeQ Windows print servers
- Configure registry settings on the print servers to enable them to be accessed via a shared name
- Configure name resolution related settings on the print servers
- Point users at the VIP to access the print server and the printer shares

6. Deployment Concept
6.1. Virtual Service (VIP) Requirements

A single virtual service is required which load balances SafeQ traffic on the required ports.

7. Load Balancer Deployment Methods

The load balancer can be deployed in 4 fundamental ways: Layer 4 DR mode, Layer 4 NAT mode, Layer 4 SNAT mode, and Layer 7 SNAT mode.

For SafeQ, using layer 4 DR mode or layer 7 SNAT mode is recommended. These modes are described below and are used for the configurations presented in this guide. For configuring using DR mode please refer to Appliance Configuration for SafeQ – Using Layer 4 DR Mode and for configuring using a combination of layer 4 NAT mode and layer 7 SNAT mode refer to Appliance Configuration for SafeQ – Using Layer 7 SNAT Mode.

7.1. Layer 4 DR Mode

Layer 4 DR (Direct Routing) mode is a very high performance solution that requires little change to your existing infrastructure.

Note: Kemp, Brocade, Barracuda & A10 Networks call this Direct Server Return and F5 call it nPath.
DR mode works by changing the destination MAC address of the incoming packet to match the selected Real Server on the fly which is very fast.

When the packet reaches the Real Server it expects the Real Server to own the Virtual Services IP address (VIP). This means that each Real Server (and the load balanced application) must respond to both the Real Server’s own IP address and the VIP.

The Real Server should not respond to ARP requests for the VIP. Only the load balancer should do this. Configuring the Real Server in this way is referred to as "Solving the ARP Problem". For more information please refer to DR Mode Considerations.

On average, DR mode is 8 times quicker than NAT mode for HTTP and much faster for other applications such as Remote Desktop Services, streaming media and FTP.

The load balancer must have an interface in the same subnet as the Real Servers to ensure layer 2 connectivity which is required for DR mode to operate.

The VIP can be brought up on the same subnet as the Real Servers or on a different subnet provided that the load balancer has an interface in that subnet.

Port translation is not possible with DR mode, e.g. VIP:80 → RIP:8080 is not supported.

DR mode is transparent, i.e. the Real Server will see the source IP address of the client.

7.2. Layer 7 SNAT Mode

Layer 7 SNAT mode uses a proxy (HAProxy) at the application layer. Inbound requests are terminated on the load balancer and HAProxy generates a new corresponding request to the chosen Real Server. As a result, Layer 7 is typically not as fast as the Layer 4 methods. Layer 7 is typically chosen when either enhanced options such as SSL termination, cookie based persistence, URL rewriting, header insertion/deletion etc. are required, or when the network topology prohibits the use of the layer 4 methods.
Because layer 7 SNAT mode is a full proxy, any server in the cluster can be on any accessible subnet including across the Internet or WAN.

Layer 7 SNAT mode is not transparent by default, i.e. the Real Servers will not see the source IP address of the client, they will see the load balancer’s own IP address by default, or any other local appliance IP address if preferred (e.g. the VIP address). This can be configured per layer 7 VIP. If required, the load balancer can be configured to provide the actual client IP address to the Real Servers in 2 ways. Either by inserting a header that contains the client’s source IP address, or by modifying the Source Address field of the IP packets and replacing the IP address of the load balancer with the IP address of the client. For more information on these methods please refer to Transparency at Layer 7.

Layer 7 SNAT mode can be deployed using either a one-arm or two-arm configuration. For two-arm deployments, eth0 is normally used for the internal network and eth1 is used for the external network although this is not mandatory.

Requires no mode-specific configuration changes to the load balanced Real Servers.

Port translation is possible with Layer 7 SNAT mode, e.g. VIP:80 → RIP:8080 is supported.

You should not use the same RIP:PORT combination for layer 7 SNAT mode VIPs and layer 4 SNAT mode VIPs because the required firewall rules conflict.

### 7.3. Our Recommendation

Where possible, we recommend that Layer 4 Direct Routing (DR) mode is used. This mode offers the best possible performance since replies go directly from the Real Servers to the client, not via the load balancer. It’s also relatively simple to implement. Ultimately, the final choice does depend on your specific requirements and infrastructure.

If DR mode cannot be used, for example if the real servers are located in remote routed networks, then Layer 7 SNAT mode is recommended.

If the load balancer is deployed in AWS, Azure, or GCP, layer 7 SNAT mode must be used as layer 4 direct routing.
is not currently possible on these platforms.

8. Configuring Print Servers for Load Balancing

The following steps should be carried out on each print server defined in the virtual service:

1. Join the server to the same domain as the client PCs.
2. Install the Print and Document Service role / Print Server service.
3. Install and share the printers (use exactly the same share names and permissions across all servers).
4. If DR mode is used, solve the ‘ARP problem’ on each print server, to that DR mode will work. For detailed steps on solving the ARP problem for the various versions of Windows, please refer to Solving the ARP Problem for more information.

When configuring the Loopback Adapter to solve the ARP Problem, the following options must also be checked (ticked):

- **Important**
  - Client for Microsoft Networks and File & Printer Sharing for Microsoft Networks

8.1. Registry Modifications

To enable the print servers to be accessed via a shared name (SafeQ in the example virtual service in this guide), add the following registry entries to each print server:

- **Key**: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa
  - **Value**: DisableLoopbackCheck
  - **Type**: REG_DWORD
  - **Data**: 1

- **Key**: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanserver\parameters
  - **Value**: DisableStrictNameChecking
  - **Type**: REG_DWORD
  - **Data**: 1

- **Key**: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\lanmanserver\parameters
  - **Value**: OptionalNames
  - **Type**: REG_MULTI_SZ
  - **Data**: SafeQ

**Note**

In the example presented here, SafeQ is the name that will be used to access the load balanced print servers via the virtual service (VIP) created on the load balancer. This can be set to any appropriate name. Whatever name is used, it must resolve to the IP address of the VIP as explained in the section below.
Microsoft Windows Server 2008 Specific Registry Change

If Microsoft Windows Server 2008 is used as the operating system for the printer servers, an additional registry entry change is required. The following registry entry should be changed from a DWORD to a QWORD:

Key: HKLM\SYSTEM\CurrentControlSet\Control\Print\DNSOneWire
Value: DnsOnWire
Type: REG_QWORD
Data: 1

8.2. Configuring Name Resolution

For printer load balancing to work, either DNS or NetBIOS name resolution should be configured as detailed below.

DNS Name Resolution (Windows 2000 & later)

To configure DNS name resolution, the following steps should be completed:

1. NetBIOS over TCP/IP should be disabled on all interfaces of each print server, as shown.
2. A host name and corresponding "Host (A)" record for the virtual SafeQ service that matches the virtual IP (VIP) address for the load balancer should be created.

NetBIOS Name Resolution (legacy Environments)

To configure NetBIOS name resolution, the following steps should be completed:

1. NetBIOS over TCP/IP should be disabled on the main NIC and left enabled on the Loopback adapter on each print server.
2. Either a WINS server should be set up and all clients configured to use this, or pre-loaded entries in the LMHosts file of each client should be set up.

As shown in the flow chart in this Technet article, for a default H-node client, NetBIOS name resolution occurs in the following order:

1. Local NetBIOS cache.
2. WINS server.
4. Local LMHosts file. Therefore, to avoid broadcast, LMHost.

Therefore, to avoid broadcast, LMHost entries must be declared as pre-loaded to ensure they are available in the local NetBIOS cache.

Configuring the LMHosts file

This is done by creating an entry like so:
Entries with the #PRE directive are loaded into the cache on reboot, or can be forced using the command:

```
nbtstat -R
```

The following command can be used to view the cache and verify that the entry has been added:

```
nbtstat -c
```

8.3. Installing and Configuring YSoft SafeQ (Version 6 rev. 42)
The SafeQ Print Management software should be set up by following the steps outlined in the YSoft SafeQ documentation, which details the setup, service, and functions of Ysoft SafeQ.

8.4. Finalising the Server Configuration
To finalise the print server configuration changes, each print server must be rebooted.

9. Loadbalancer.org Appliance – the Basics

9.1. Virtual Appliance
A fully featured, fully supported 30 day trial is available if you are conducting a PoC (Proof of Concept) deployment. The VA is currently available for VMware, Virtual Box, Hyper-V, KVM, XEN and Nutanix AHV and has been optimized for each Hypervisor. By default, the VA is allocated 2 vCPUs, 4GB of RAM and has a 20GB virtual disk. The Virtual Appliance can be downloaded [here](#).

<table>
<thead>
<tr>
<th>Note</th>
<th>The same download is used for the licensed product, the only difference is that a license key file (supplied by our sales team when the product is purchased) must be applied using the appliance’s WebUI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>Please refer to Virtual Appliance Installation and the ReadMe.txt text file included in the VA download for additional information on deploying the VA using the various Hypervisors.</td>
</tr>
<tr>
<td>Note</td>
<td>The VA has 4 network adapters. For VMware only the first adapter (eth0) is connected by default. For HyperV, KVM, XEN and Nutanix AHV all adapters are disconnected by default. Use the network configuration screen within the Hypervisor to connect the required adapters.</td>
</tr>
</tbody>
</table>

9.2. Initial Network Configuration
After boot up, follow the instructions on the appliance console to configure the management IP address, subnet mask, default gateway, DNS servers and other network and administrative settings.
9.3. Accessing the Appliance WebUI

The WebUI is accessed using a web browser. By default, users are authenticated using Apache authentication. Users can also be authenticated against LDAP, LDAPS, Active Directory or Radius - for more information, please refer to External Authentication.

There are certain differences when accessing the WebUI for the cloud appliances. For details, please refer to the relevant Quick Start / Configuration Guide.

1. Using a browser, navigate to the following URL:


You’ll receive a warning about the WebUI’s SSL certificate. This is due to the default self signed certificate that is used. If preferred, you can upload your own certificate - for more information, please refer to Appliance Security Features.

If you need to change the port, IP address or protocol that the WebUI listens on, please refer to Service Socket Addresses.

2. Log in to the WebUI using the following credentials:

Username: loadbalancer
Password: <configured-during-network-setup-wizard>

To change the password, use the WebUI menu option: Maintenance > Passwords.

Once logged in, the WebUI will be displayed as shown below:
3. You’ll be asked if you want to run the Setup Wizard which can be used to configure layer 7 services. Click **Dismiss** if you’re following a guide or want to configure the appliance manually or click **Accept** to start the wizard.

**Main Menu Options**

- **System Overview** - Displays a graphical summary of all VIPs, RIPs and key appliance statistics
- **Local Configuration** - Configure local host settings such as IP address, DNS, system time etc.
- **Cluster Configuration** - Configure load balanced services such as VIPs & RIPs
- **Maintenance** - Perform maintenance tasks such as service restarts and taking backups
- **View Configuration** - Display the saved appliance configuration settings
- **Reports** - View various appliance reports & graphs
- **Logs** - View various appliance logs
- **Support** - Create a support download, contact the support team & access useful links
- **Live Chat** - Start a live chat session with one of our Support Engineers

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9.4. Appliance Software Update

To ensure that the appliance(s) are running the latest software version, we recommend a software update check is performed.

Determining the Current Software Version

The software version is displayed at the bottom of the WebUI as shown in the example below:

---

Checking for Updates using Online Update

By default, the appliance periodically contacts the Loadbalancer.org update server and checks for updates. An update check can also be manually triggered as detailed below.

1. Using the WebUI, navigate to: Maintenance > Software Update.
2. Select Online Update.
3. If the latest version is already installed, a message similar to the following will be displayed:

   **Information:** Version v8.11.1 is the current release. No updates are available

4. If an update is available, you'll be presented with a list of new features, improvements, bug fixes and security related updates.
5. Click Online Update to start the update process.

   **Note**  Do not navigate away whilst the update is ongoing, this may cause the update to fail.

6. Once complete (the update can take several minutes depending on download speed and upgrade version) the following message will be displayed:

   **Information:** Update completed successfully.

7. If services need to be reloaded/restarted or the appliance needs a full restart, you'll be prompted accordingly.

Using Offline Update

If the load balancer does not have access to the Internet, offline update can be used.
To perform an offline update:

1. Using the WebUI, navigate to: **Maintenance > Software Update**.
2. Select **Offline Update**.
3. The following screen will be displayed:

   **Software Update**

   **Offline Update**

   The following steps will lead you through offline update.

   1. Contact support@loadbalancer.org to obtain the offline update archive and checksum.
   2. Save the archive and checksum to your local machine.
   3. Select the archive and checksum files in the upload form below.
   4. Click Upload and Install to begin the update process.

   **Archive:** Choose File  No file chosen
   **Checksum:** Choose File  No file chosen
   **Upload and Install**

   4. Select the **Archive** and **Checksum** files.
   5. Click **Upload and Install**.
   6. If services need to be reloaded/restarted or the appliance needs a full restart, you'll be prompted accordingly.

### 9.5. Ports Used by the Appliance

By default, the appliance uses the following TCP & UDP ports:

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>22 *</td>
<td>SSH</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>53 *</td>
<td>DNS / GSLB</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>123</td>
<td>NTP</td>
</tr>
<tr>
<td>TCP &amp; UDP</td>
<td>161 *</td>
<td>SNMP</td>
</tr>
<tr>
<td>UDP</td>
<td>6694</td>
<td>Heartbeat between Primary &amp; Secondary appliances in HA mode</td>
</tr>
<tr>
<td>TCP</td>
<td>7778</td>
<td>HAProxy persistence table replication</td>
</tr>
<tr>
<td>TCP</td>
<td>9000 *</td>
<td>Gateway service (Centralized/Portal Management)</td>
</tr>
<tr>
<td>TCP</td>
<td>9080 *</td>
<td>WebUI - HTTP (disabled by default)</td>
</tr>
<tr>
<td>TCP</td>
<td>9081 *</td>
<td>Nginx fallback page</td>
</tr>
<tr>
<td>Protocol</td>
<td>Port</td>
<td>Purpose</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>TCP</td>
<td>9443</td>
<td>WebUI - HTTPS</td>
</tr>
<tr>
<td>TCP</td>
<td>25565</td>
<td>Shuttle service (Centralized/Portal Management)</td>
</tr>
</tbody>
</table>

The ports used for SSH, GSLB, SNMP, the WebUI, the fallback page, the gateway service and the shuttle service can be changed if required. For more information, please refer to Service Socket Addresses.

### 9.6. HA Clustered Pair Configuration
Loadbalancer.org recommend that load balancer appliances are deployed in pairs for high availability. In this guide a single unit is deployed first, adding a secondary unit is covered in Configuring HA - Adding a Secondary Appliance.

### 10. Appliance Configuration for SafeQ – Using Layer 4 DR Mode

#### 10.1. Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to **Cluster Configuration > Layer 4 – Virtual Services** and click on **Add a new Virtual Service**.
2. Define the **Label** for the virtual service as required, e.g. **Safe**.
3. Set the **Virtual Service IP Address** field to the required IP address, e.g. **10.10.10.191**.
4. Set the **Ports** field as needed, depending on your MFP vendor.
5. Leave the **Protocol** set to **TCP**.
6. Leave the **Forwarding Method** set to **Direct Routing**.
7. Click **Update** to create the virtual service.
8. Click Modify next to the newly created VIP.

9. Ensure that the Persistence Enable checkbox is not checked.

10. Set the Health Checks Check Port to 515.

11. Click Update.

10.2. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to Cluster Configuration > Layer 4 – Real Servers and click on Add a new Real Server next to the newly created VIP.

2. Define the Label for the real server as required, e.g. SafeQ Server 1.

3. Set the Real Server IP Address field to the required IP address, e.g. 10.10.10.198.

4. Click Update.

5. Repeat these steps to add additional print servers as required.
10.3. Configuring Terminal Server Nodes for Load Balancing

After creating the virtual service on the load balancer, configuration changes need to be made to the SafeQ TerminalServer.exe.config file to allow load balancing to work correctly. These changes configure an embedded terminal, to be installed on a device (e.g. MFD), to use the load balancer’s VIP address.

Set YSoft SafeQ Terminal Server to use the load balancer’s virtual DNS name

The following steps should be carried out on all YSoft SafeQ servers that are part of the Spooler Controller group:

1. Edit the file `<SafeQ_dir>\SPOC\terminalserver\TerminalServer.exe.config`.
2. Set the load balancer’s virtual DNS name in the `networkAddress` parameter.
3. In the `AppSettings` section of the config file add a new `scanServerIp` parameter and set it to the physical IP address of the local terminal server node: `<add key="scanServerIp" value="physical_IP_address" />`
4. Save the file.
5. Restart YSoft SafeQ Terminal Server services to apply the settings.

11. Appliance Configuration for SafeQ – Using Layer 7 SNAT Mode

11.1. Configuring the Virtual Service (VIP)

1. Using the web user interface, navigate to Cluster Configuration > Layer 7 – Virtual Services and click on Add a new Virtual Service.
2. Define the `Label` for the virtual service as required, e.g. SafeQ.
3. Set the `Virtual Service IP Address` field to the required IP address, e.g. 10.10.10.197.
4. Set the `Ports` field to 515,7800.
5. Set the `Layer 7 Protocol` to TCP Mode.
6. Click Update to create the virtual service.
11.2. Defining the Real Servers (RIPs)

1. Using the web user interface, navigate to Cluster Configuration > Layer 7 – Real Servers and click on Add a new Real Server next to the newly created VIP.

2. Define the Label for the real server as required, e.g. SafeQ Server 1.

3. Set the Real Server IP Address field to the required IP address, e.g. 10.10.10.198.

4. Click Update.

5. Repeat these steps to add additional print servers as required.

11.3. Finalizing the Layer 7 Configuration

To apply the new settings, HAProxy must be reloaded. This can be done using the button in the “Commit changes” box at the top of the screen or by using the Restart Services menu option:

1. Using the WebUI, navigate to Maintenance > Restart Services.

2. Click Reload HAProxy.
11.4. Configuring Terminal Server Nodes for Load Balancing

After creating the virtual service on the load balancer, additional SafeQ configuration changes need to be made.

Follow the instructions in Configuring Terminal Server Nodes for Load Balancing.

12. Testing & Verification

For additional guidance on diagnosing and resolving any issues you may have, please also refer to Diagnostics & Troubleshooting.

Regardless of the load balancing method employed, ensure that the instructions in Configuring Terminal Server Nodes for Load Balancing have been completed.

If layer 4 DR mode is being used, ensure that the "ARP problem" has been solved on each print server. This is required for DR mode to work. For detailed steps on solving the ARP problem for the various versions of Windows, please refer to Solving the ARP Problem for more information.

When configuring the Loopback Adapter to solve the ARP Problem, the following options must also be checked (ticked):

- Client for Microsoft Networks and File & Printer Sharing for Microsoft Networks

The load balanced print service can be tested, either by browsing to the virtual service IP address or the share name. In the example presented in this document, this would be done by going to

\10.10.10.150

or

\SafeQ

Any shared printers and shared folders that have been configured on the real print servers should be visible.

13. Technical Support

For more details about configuring the appliance and assistance with designing your deployment please don’t hesitate to contact the support team using the following email address: support@loadbalancer.org.

14. Further Documentation

For additional information, please refer to the Administration Manual.
15. Appendix

15.1. Solving the ARP Problem

When using Layer 4 DR mode, the ARP problem must be solved. This involves configuring each Real Server to be able to receive traffic destined for the VIP, and ensuring that each Real Server does not respond to ARP requests for the VIP address – only the load balancer should do this. The steps below are for Windows 2012 & later.

Windows Server 2012 & Later

Windows Server 2012 and later support Direct Routing (DR) mode through the use of the Microsoft Loopback Adapter that must be installed and configured on each load balanced (Real) Server. The IP address configured on the Loopback Adapter must be the same as the Virtual Service (VIP) address. This enables the server to receive packets that have their destination set as the VIP address. If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be added to the Loopback Adapter.

In addition, the strong/weak host behavior must be configured on each Real Server. The weak host model allows packets with any IP to be sent or received via an interface. The strong host model only allows packets with an IP belonging to the interface to be sent or received.

**Important** The following 3 steps must be completed on all Real Servers associated with the VIP.

**Step 1 of 3: Install the Microsoft Loopback Adapter**

1. Click **Start**, then run **hdwwiz** to start the Hardware Installation Wizard.
2. Once the Wizard has started, click **Next**.
3. Select **Install the hardware that I manually select from a list (Advanced)**, click **Next**.
4. Select **Network adapters**, click **Next**.

![Add Hardware](image)
5. Select Microsoft & Microsoft KM-Test Loopback Adapter, click Next.
6. Click Next to start the installation, when complete click Finish.

**Step 2 of 3: Configure the Loopback Adapter**

1. Open Control Panel and click Network and Sharing Center.
2. Click Change adapter settings.
3. Right-click the new Loopback Adapter and select Properties.

**Note**
You can configure IPv4 or IPv6 addresses or both depending on your requirements.

**Important**
When configuring the loopback adapter properties, make sure that Client for Microsoft Networks and File & Printer Sharing for Microsoft Networks is also checked as shown below.

**IPv4 Addresses**

1. Uncheck all items except Client for Microsoft Networks, File & Printer Sharing for Microsoft Networks and Internet Protocol Version 4 (TCP/IPv4) as shown below:

2. Ensure that Internet Protocol Version (TCP/IPv4) is selected, click Properties and configure the IP address to be the same as the Virtual Service address (VIP) with a subnet mask of 255.255.255.255, e.g. 192.168.2.20/255.255.255.255 as shown below:
192.168.2.20 is an example, make sure you specify the correct VIP address.

If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be added to the Loopback Adapter.

3. Click OK then click Close to save and apply the new settings.

IPv6 Addresses

1. Uncheck all items except Client for Microsoft Networks, File & Printer Sharing for Microsoft Networks and Internet Protocol Version 6 (TCP/IPv6) as shown below:
2. Ensure that **Internet Protocol Version (TCP/IPv6)** is selected, click **Properties** and configure the IP address to be the same as the Virtual Service (VIP) and set the **Subnet Prefix Length** to be the same as your network setting, e.g. **2001:470:1f09:e72::15/64** as shown below:

!!! purple

**Note**  
2001:470:1f09:e72::15/64 is an example, make sure you specify the correct VIP address. 

!!! purple

**Note**  
If a Real Server is included in multiple DR mode VIPs, an IP address for each VIP must be
3. Click OK then click Close to save and apply the new settings.

**Step 3 of 3: Configure the strong/weak host behavior**

The strong/weak host behavior can be configured using either of the following 2 methods:

- Option 1 - Using Network Shell (netsh) commands
- Option 2 - Using PowerShell cmdlets

The commands in this section assume that the LAN Adapter is named "net" and the Loopback Adapter is named "loopback" as shown in the example below:

> **Important** Either adjust the commands to use the names allocated to your LAN and loopback adapters, or rename the adapters before running the commands. Names are case sensitive so make sure that the interface names used in the commands match the adapter names exactly.

**Option 1 - Using Network Shell (netsh) Commands**

To configure the correct strong/weak host behavior run the following commands:

For IPv4 addresses:

```
netsh interface ipv4 set interface "net" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostreceive=enabled
netsh interface ipv4 set interface "loopback" weakhostsend=enabled
```

For IPv6 addresses:

```
netsh interface ipv6 set interface "net" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostreceive=enabled
netsh interface ipv6 set interface "loopback" weakhostsend=enabled
netsh interface ipv6 set interface "loopback" dadtransmits=0
```

**Option 2 - Using PowerShell Cmdlets**

For IPv4 addresses:

```powershell
Set-NetInterface -Name "net" -WeakHostReceive $true -WeakHostSend $true
Set-NetInterface -Name "loopback" -WeakHostReceive $true -WeakHostSend $true
```
Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled -DadTransmits 0 -AddressFamily IPv4

Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv4

For IPv6 Addresses:

Set-NetIpInterface -InterfaceAlias loopback -WeakHostReceive enabled -WeakHostSend enabled -DadTransmits 0 -AddressFamily IPv6

Set-NetIpInterface -InterfaceAlias net -WeakHostReceive enabled -AddressFamily IPv6

15.2. Configuring HA - Adding a Secondary Appliance

Our recommended configuration is to use a clustered HA pair of load balancers to provide a highly available and resilient load balancing solution. We recommend that the Primary appliance is fully configured first, then the Secondary appliance can be added to create an HA pair. Once the HA pair is configured, load balanced services must be configured and modified on the Primary appliance. The Secondary appliance will be automatically kept in sync.

Note

For Enterprise Azure, the HA pair should be configured first. For more information, please refer to the Azure Quick Start/Configuration Guide available in the documentation library.

The clustered HA pair uses Heartbeat to determine the state of the other appliance. Should the active device (normally the Primary) suffer a failure, the passive device (normally the Secondary) will take over.

Non-Replicated Settings

A number of settings are not replicated as part of the Primary/Secondary pairing process and therefore must be manually configured on the Secondary appliance. These are listed by WebUI menu option in the table below:

<table>
<thead>
<tr>
<th>WebUI Main Menu Option</th>
<th>Sub Menu Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Configuration</td>
<td>Hostname &amp; DNS</td>
<td>Hostname and DNS settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Network Interface Configuration</td>
<td>Interface IP addresses, bonding configuration and VLANs</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Routing</td>
<td>Default gateways and static routes</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>System Date &amp; time</td>
<td>Time and date related settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Physical – Advanced Configuration</td>
<td>Various appliance settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Portal Management</td>
<td>Portal management settings</td>
</tr>
<tr>
<td>Local Configuration</td>
<td>Security</td>
<td>Security settings</td>
</tr>
</tbody>
</table>
## Configuring the HA Clustered Pair

### Important
Make sure that where any of the above have been configured on the Primary appliance, they're also configured on the Secondary.

### Note
If you have already run the firewall lockdown wizard on either appliance, you'll need to ensure that it is temporarily disabled on both appliances whilst performing the pairing process.

1. Deploy a second appliance that will be the Secondary and configure initial network settings.
2. Using the WebUI on the Primary appliance, navigate to: **Cluster Configuration > High-Availability Configuration**.

### Create a Clustered Pair

3. Specify the IP address and the `loadbalancer` user's password for the Secondary (peer) appliance as shown in the example above.
4. Click **Add new node**.
5. The pairing process now commences as shown below:
6. Once complete, the following will be displayed on the Primary appliance:

![High Availability Configuration - primary](image)

7. To finalize the configuration, restart heartbeat and any other services as prompted in the “Commit changes” message box at the top of the screen.

**Note**
Clicking the **Restart Heartbeat** button on the Primary appliance will also automatically restart heartbeat on the Secondary appliance.

**Note**
For more details on configuring HA with 2 appliances, please refer to Appliance Clustering for HA.

**Note**
For details on testing and verifying HA, please refer to Clustered Pair Diagnostics.
## 16. Document Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change</th>
<th>Reason for Change</th>
<th>Changed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>31 July 2020</td>
<td>Initial version</td>
<td></td>
<td>NH, AH</td>
</tr>
<tr>
<td>1.0.1</td>
<td>24 November 2020</td>
<td>Added instructions on configuring SafeQ Terminal Server nodes for load balancing</td>
<td>Required updates</td>
<td>NH, AH</td>
</tr>
<tr>
<td>1.1.0</td>
<td>1 November 2021</td>
<td>Converted the document to AsciiDoc</td>
<td>Move to new documentation system</td>
<td>AH, RJC, ZAC</td>
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<tr>
<td>1.1.1</td>
<td>28 September 2022</td>
<td>Updated layer 7 VIP and RIP creation screenshots</td>
<td>Reflect changes in the web user interface</td>
<td>AH</td>
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<tr>
<td>1.1.2</td>
<td>5 January 2023</td>
<td>Combined software version information into one section</td>
<td>Housekeeping across all documentation</td>
<td>AH</td>
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<tr>
<td></td>
<td></td>
<td>Added one level of section numbering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added software update instructions</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Added table of ports used by the appliance</td>
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<td></td>
<td></td>
<td>Reworded 'Further Documentation' section</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removed references to the colour of certain UI elements</td>
<td></td>
<td></td>
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<tr>
<td>1.1.3</td>
<td>2 February 2023</td>
<td>Updated screenshots</td>
<td>Branding update</td>
<td>AH</td>
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<tr>
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<td>7 March 2023</td>
<td>Removed conclusion section</td>
<td>Updates across all documentation</td>
<td>AH</td>
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<tr>
<td>1.2.0</td>
<td>24 March 2023</td>
<td>New document theme</td>
<td>Branding update</td>
<td>AH</td>
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<td></td>
<td></td>
<td>Modified diagram colours</td>
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</table>
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